AQUATIC MACROPHYTE REPORT OF THE SHEBANDOWAN LAKES SYSTEM

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1973

Ontario
Ministry of the Environment

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SUMMARY

The Shebandowan Lakes system was found to contain a general pattern of scattered and sparse populations of aquatic vascular plants. The transect method of sampling revealed that Isoetes spp., Myriophyllum spp. and Potamogeton robbinsii were the most abundant plants present in Lake Shebandowan. This method of sampling also illustrated specific preferences by Isoetes and Myriophyllum for sand and silt substrates respectively. Furthermore, the quadrat sampling method revealed higher plant densities in Lower Shebandowan than in either of Middle or Upper Shebandowan Lakes.

The presence and reported presence of vascular plants and filamentous algae on the spawning beds in Middle Shebandowan, as indicated herein, may be a possible explanation for decreasing trout numbers. A more intensive study of this area will be conducted in the very near future to assess the impact of plant population on these spawning beds.

INTRODUCTION

In the last few years there has been a growing concern regarding the water quality in the Shebandowan Lakes. Individuals who have been associated with the lakes, such as camp owners, fishermen, and personnel of the Ministry of Natural Resources, have suggested changes in the amount of aquatic weed growth have occurred. Both casual and trained observers suggest that the existence of aquatic weed beds were very much the exception only 20 years ago. Mr. R. Ryder, a fisheries research biologist, who has worked in the Shebandowan Lakes periodically since 1954 has indicated that in some areas there are extensive weed growths which were simply not in evidence as recently as five years ago.(1)

The Ministry, aware of the growing concern being voiced over changes in the lakes system, undertook a general assessment of the water quality throughout the summer of 1972. As part of this study, an intensive survey of the density and variety of aquatic macrophytes present in the Shebandowan Lakes was carried out during a period from July 26 to August 11, as well as on October 25. This report presents the results of the aquatic plant survey.

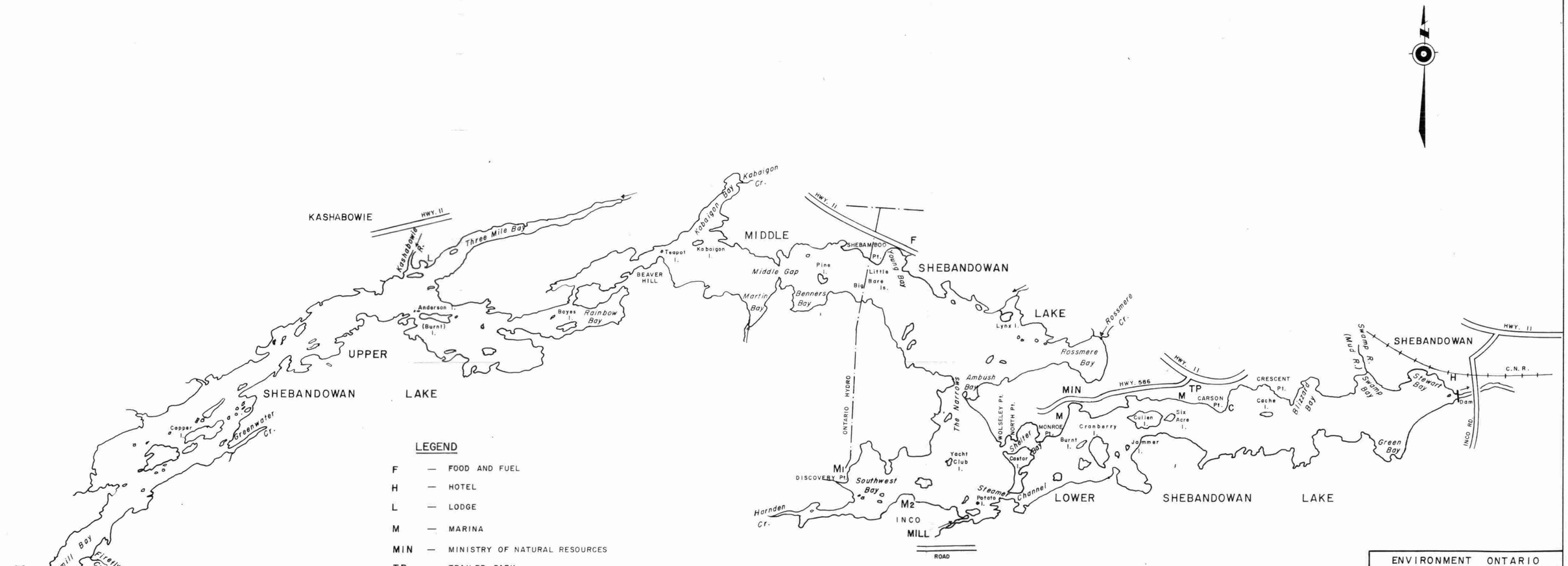
A further report summarizing the findings of the entire Shebandowan Lakes study will be issued separately at a later date.

DESCRIPTION OF STUDY AREA

The Shebandowan Lakes system (Figure 1) is situated approximately 80 kilometres (50 miles) northwest of the City of Thunder Bay in the District of Thunder Bay.

The system has an east-west axis with a total length of 36.4 kilometres (24 miles), and a width of 3.2 kilometres (2 miles) at its widest point. The chain is divided into three bodies of water known as Upper, Middle and Lower Shebandowan Lakes. The lakes have a total surface area of approximately 58.3 square kilometres (22.8 Sq. Mi.) and drain a watershed of approximately 1188 square kilometres (457 Sq. Mi.)

The lakes receive water from six major streams; Greenwater and Firefly Creeks and the Kashabowie River in Upper Shebandowan Lake, Kabaigon Creek in Middle Shebandowan and Harnden Creek and the Swamp River in Lower Shebandowan Lake. There are a number of other small creeks and tributaries which complete the inflowing waters. The only outflow is the Shebandowan River which drains the system at the Townsite of Shebandowan at the eastern extreme of Lower Shebandowan Lake. The Shebandowan River eventually joins the Kaministikwia River which discharges into Lake Superior.



ENVIRONMENT ONTARIO

SHEBANDOWAN LAKES SYSTEM
FIGURE: 1

SCALE: AS SHOWN	
DRAWN BY: L.L. BROOME	DATE: JULY, 1973
CHECKED BY: M.G.	DRAWING Nº: 72-39-WQ

The system lies in a region of acidic Precambrian formations with an overburden of shallow sandy soils and local pockets of deep sand deposits.

The area receives an annual rainfall and snowfall of 68.6 and 203.2 centimetres (27.0 and 80.0 inches) respectively. It is characterized by an average July temperature of 18°C (64°F) and a January temperature of -16°C (7°F).

The surrounding watershed is covered with Spruce, Fir, Poplar, White Birch and Jack Pine. Mining of nickel, copper and iron reserves is carried out in the immediate vicinity, with an ore deposit presently being mined and milled on Lower Shebandowan Lake. All wastes from mine and milling operations are discharged following treatment into Gold Creek which enters the Matawin River. This river joins with the Shebandowan River downstream of Lower Lake Shebandowan.

Cottages in the area number about 750, the majority of these being concentrated along the shoreline of Lower Lake Shebandowan, with a small proportion on Middle Lake Shebandowan. Upper Lake Shebandowan is virtually unpopulated except for a number of lodges and camps at the mouth of the Kashabowie River. In most instances, treatment facilities for domestic wastes consist of sub-surface disposal by means of septic tank and tile fields. In some localities where conditions are

suitable, lagoons are being utilized on a community basis.

Parts of the lake system were formerly used for floating logs to local sawmills scattered along the shoreline. However, as wood reserves dwindled in the area, these sawmills, too, were soon abandoned. Present day uses of the Shebandowan Lakes include sailing, water-skiing, swimming, fishing and other water-oriented recreational sports, as well as a water supply source for summer camps.

Fish in the system include bass, walleye, pike, whitefish, cisco, white sucker, burbot and perch, as well as lake trout, an indigenous and once plentiful species which is now reported to occur in the lakes in low numbers.

ROLE OF VASCULAR AQUATIC PLANTS IN THE AQUATIC ENVIRONMENT

Vascular plants fulfill important functions within the aquatic ecosystem. Available oxygen, produced through photosynthesis, is essential to organisms from microscopic bacteria to the largest fish. Another advantage gained from aquatic plants is the shading and cooling effect on sediments as well as the stabilizing of these sediments by the restriction of water movement. Fish and aquatic insects utilize plants for protection, food and nest building sites.[2]

The potential of aquatic plant growth is limited by many factors. Among these are light penetration, suitability of the bottom for rooting, and perhaps most important, availability of nutrients in the water system. Nutrients reach a lake from inflowing streams, runoff from the land and often the discharge of wastes associated with human settlement. Under many circumstances, dense growths of aquatic plants have proven to be detrimental. Where prolific macrophyte populations exist, competition with phytoplankton for nutrients may result in reduced algal populations. This, in turn, reduces available food for zooplankton and through the complex interaction with the biotic food chains, essentially results in decreased production of fish. Plant growth on spawning beds might also have detrimental consequences. Egg respiration would be restricted with subsequent mortalities if filamentous algae and/or rooted plants were prolific to the point whereby photosynthesis or decomposition in spawning areas produced critical conditions of anoxia or oxygen anemia, respectively. Furthermore, nuisance levels of aquatic plants greatly impair the recreation potential of any lake where sports such as swimming, boating and water-skiing are enjoyed.

FIELD AND LABORATORY METHODS

Prior to any field sampling, stations were selected and mapped (Figure 2). Considerations in choosing sampling stations were: the nature of the shoreline, approximate depth, and time available. Two methods of sampling were employed, the first being the use of transects. An 80-metre length of rope was marked with bright yellow polypropylene at five-metre intervals, and was stretched out to its full length from the shoreline and allowed to sink to the bottom. A diver with snorkel gear, commencing from the shoreline, would report the species of aquatic plants[3] and their relative densities found in a circle around each marker. The size of the circle was restricted arbitrarily to approximately 1/2 metre in diameter. The data were recorded by the other member of the crew, watching from the boat. At this time the substrate type, water depth and visible shoreline vegetation were also recorded. The transect method was only utilized in large bays, where it was hoped that the water depth increased from the shoreline uniformly. A total of 35 transect stations were selected.

The second sampling technique utilized was a weighted wooden quadrat, enclosing an area of one fourth of a square metre. The quadrat was randomly thrown from the boat at 76

preselected stations. This was usually done in two to four metres of water, and the diver would approximate and report the percentage cover within the quadrat, along with the species which constituted this cover.* The diver, in a more general assessment, would then swim a circle around the boat approximately 10 metres in radius, and again report the species present and their respective densities. On October 25, a similar assessment was made on the spawning beds between Little and Big Bare Islands on Middle Shebandowan.

Representatives of the plants from the Shebandowan Lake system were collected for preservation. The preserving method constituted a three day immersion in a solution of commercial formalin, glacial acetic acid, 50% ethonal and cupric acetate. This was followed by replacing the solution with 4% formalin. Duplicate samples were pressed for herbarium specimens.

In assessing the relative plant densities, a scale of one to four was used. The criteria being as follows:

(i) Growth of plants was extremely dense, nearing maximum cover possible.

(ii) Less dense growth than in (i) in the overall assessment but allowing for concentrated 'patch growth'.

* It was found by trials prior to the survey, that the assessments made by the three different divers involved in the study were within 3 - 5% of one another.

(iii) Species common, but growing in no real concentration.

(iv) Present but very sparse.

The survey of the Shebandowan Lakes was a qualitative one, and at no time were actual measurements of growth taken. It may be termed semi-quantitative, however, in that the percentage cover by various species was estimated.

FINDINGS AND DISCUSSION

A total of 28 species of aquatic plants were found representing 22 genera and 17 families. The list of species along with the common names are given in Table 1.

Table 1. List of aquatic plants encountered in the Shebandowan Lakes System, July 24 - August 11, 1972.

	common name
Najadaceae	
Potamogeton pectinatus L.	sago pondweed
P. gramineus L.	Variable pondweed
P. Richardsonii (Benn) Rydb.	richardsons pondweed
P. epihydrus Raf.	leafy pondweed
P. Robbinsii Oakes	robbins pondweed
P. amplifolius Tuckerm	big leaf pondweed
Najas flexilis (Willd) Rostk & Schmidt	bushy pondweed
Polygonaceae	
Polygonum natans Eaton	smartweed
Hydrocharitaceae	
Vallisneria americana Michx	wild celery
Elodea (Anacharis) *canadensis* Michx	canada waterweed
Haloragidaceae	
Myriophyllum alterniflorum DC. var *americanum* Rugsley	milfoil
Isoetaceae	
Isoetes spp.	quillwort
Equisetaceae	
Equisetum spp.	horsetail
Lobeliaceae	
Lobelia dortmanna h.	water lobelia
Cyperaceae	
Eleocharis spp.	spike rush
Scirpus spp.	soft stem bullrush
Alismaceae	
Sagittaria latifolia Willd	arrowhead

Ranunculaceae	
Ranunculus spp.	water buttercup
Sparganiaceae	
Sparganium americanum Nut.	bur reed
Lentibulariaceae	
Utricularia vulgaris L.	bladderwort
Nymphaceae	
Nuphar advena Ait	yellow water lily
Nymphaeae odorata Ait	white water lily
Brasenia Schreberi Guel	water shield
Pontederiaceae	
Heteranthera dubia (Jacq.) Mach.	water stargrass
Compositae	
Bidens beckii G.	water marigold
Typhaceae	
Typha spp.	cattail
Characeae (Algae)	
Nitella spp.	stone wort
Chara spp.	musk grass

TRANSECTS

While the initial intent of the transect evaluations was to provide a basis for comparisons of plant growths from one area of the lake to another, the variations in water depths between transects invalidate such a comparison. However, the data do yield valid and meaningful information when a comparison is made between diversity and density of plant growth and substrate characteristics. There are three main kinds of bottom type in the Shebandowan Lakes system. These are as follows:

(i) Boulders, rock and gravel with a thin silt covering.

(ii) Silt - soft sediments composed of decomposed organic matter.

(iii) Predominantly sand.

Of 33 transects representing these three substrate types; 15 fall within category (i), 12 in category (ii), and only six in category (iii).

Table 2 lists the number of times individual species were found at transect stations. The combined data from the three bodies of water in the system are included, and listed in terms of substrate type.

Table 2. Plant types and number of times occurring in three different sediment types, Lake Shebandowan, 1972.

Substrate	SILT	SAND	ROCK
No. of Transects	12	6	15
Plants and Number of Times Occurring		Plants & Occurrence	Plants & Occurrence
Isoetes	22	Isoetes 42	Myriophyllum 7
Myriophyllum	9	Lobelia 15	Vallisneria 5
P. Robbinsii	7	P. gramineus 6	P. robbinsii 5
Lobelia	7	P. robbinsii 5	P. gramineus 3
Sparganium	5	Sagittaria 5	P. pectinatus 2
P. richardsonii	5	Vallisneria 3	Ranunculus 1
P. gramineus	5	Utricularia 3	Isoetes 1
Nuphar	3	Sparganium 3	
Utricularia	3	P. pectinatus 2	
Vallisneria	3	Eleocharis 2	
Najas	3	Nuphar 1	
P. epihydrus	3	Myriophyllum 1	
Brasenia	2	P. richardsonii 1	
P. pectinatus	2		
Ranunculus	2		
Bidens	1		

The silt substrate was found to support the most diverse range of plant species in the lake. Where the bottom was not greatly disturbed, sediments had settled to form a bed of soft material, very conducive to rooting of aquatic plants. At inshore sampling areas, where the depth of water was shallow, sediment accumulation had not occurred as a result of the scouring effect of wave action. It was at these inshore stations that most of the Isoetes grew. Throughout the survey it was found that Isoetes was closely associated with a sandy substrate. The incidence of Isoetes decreased as silt accumulation increased.

Where the substrate seemed undisturbed, usually in protected bays or depths greater than 2 or 3 metres, Myriophyllum was the most abundant species, growing up to 2 metres in length. These plants seemed very much to be dependent on the presence of the soft, rich bottom found in most protected areas of the Shebandowan Lakes. Potamogeton robbinsii which displays a frond-like growth form and lies on the bottom, was the next highest in occurrence. However, unlike Myriophyllum, this species seemed less specific for the soft silt substrate. P. robbinsii was found in equally high densities in both the sandy and rocky bottom localities. Lobelia dortmanna, as Isoetes, was found predominantly at the inshore sampling areas of the transect, where the soft bottom was meagre and more likely to be disturbed.

Only six of the 33 transects were found to have a sandy bottom type. These transects were generally in shallow water with the depth increasing slowly. In these sandy areas much disturbed by water movement, Isoetes was found to be by far the most prolific species. Both Isoetes and Lobelia are capable of colonizing the more infertile and turbulent areas of the water body. Both these species were found to be firmly rooted in the sandy substrate, stabilizing the bottom and promoting further growth. Next in order of highest frequency were the pondweeds, P. gramineus and P. robbinsii. These were encountered six and five times respectively on the sandy bottom transects. P. robbinsii, as mentioned earlier, occurred frequently in all three substrate types where the water was of sufficient depth so that disturbance of the bottom was prevented. Sagittaria latifolia was found only in the sandy bottom type. This species was also restricted to the shallow inshore areas.

The rocky areas showed the least diversity of plant growth as well as the lowest densities of all three bottom conditions. Where the rocks and boulders were free of any sediment accumulations, plant growth was absent. However, crevices and depressions between boulders were often filled with a thin layer of sediment in the deeper zones. These areas were able to support sparse populations of plant life. In fifteen transects with rocky bottom types, only seven different

species were encountered. Myriophyllum occurred only seven times and was the species most frequently noted. Vallisneria americana and Potamogeton robbinsii were both found on four occasions, but in all cases growth was sparse. Since the rocky substrate was the most frequently encountered bottom type and was found to be the most restrictive to aquatic plant growth, the overall density was low.

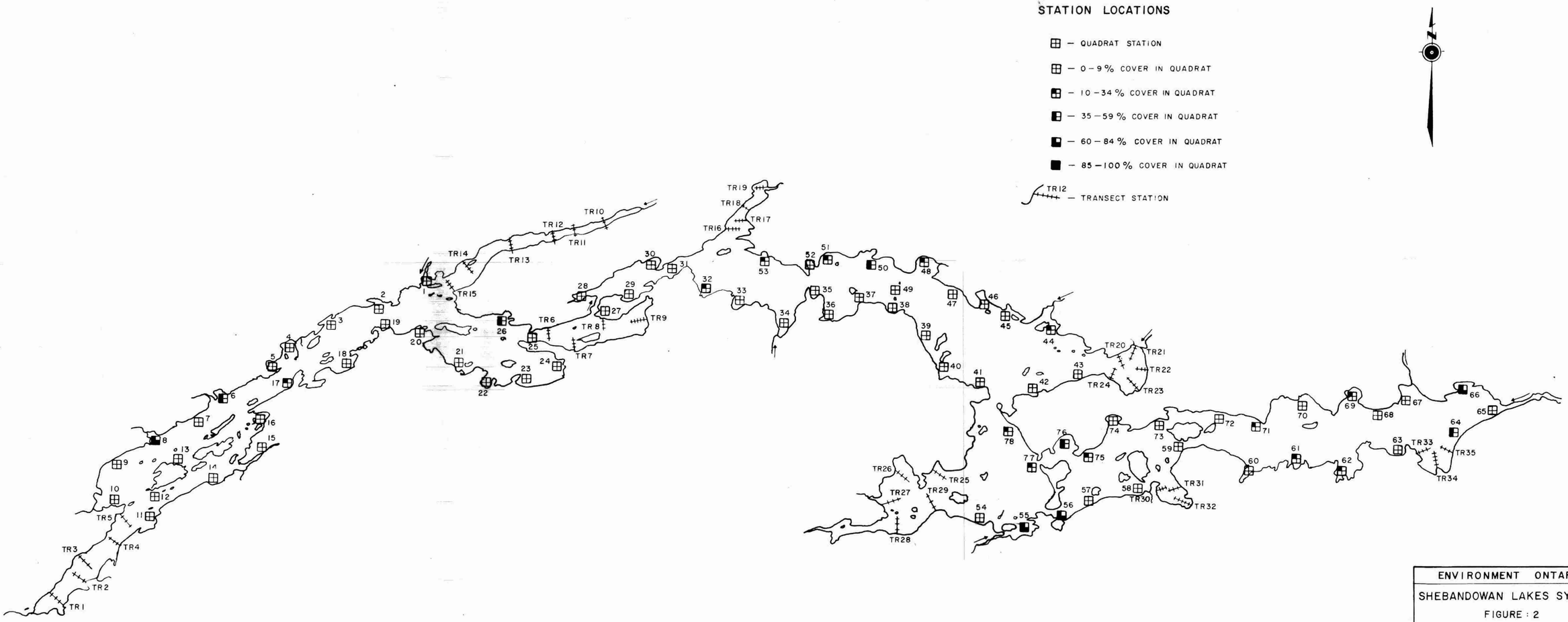
QUADRATS

The data from the quadrat stations are presented in Table 3., and Tables IV - VII of the Appendix. In all five tables the information pertaining to each of Lower, Middle and Upper Shebandowan Lakes is given separately. Table 3 deals specifically with the estimated per cent cover within the quadrat for each of the three sampling areas. Tables IV, V and VI present data from the general assessment of the survey area around the boat, in Upper, Middle and Lower Shebandowan respectively. Table VII gives the seventeen most common species, as well as their relative frequency of occurrence, expressed as a percentage. The relative frequency was calculated without regard for density. Presence or absence of the species was the only criterion.

Table 3. The estimated per cent (%) cover in the Quadrat at 78 stations on the Shebandowan Lakes system, 1972.

UPPER SHEBANDOWAN LAKE *		MIDDLE SHEBANDOWAN LAKE		LOWER SHEBANDOWAN LAKE	
Station	% Cover	Station	% Cover	Station	% Cover
1	0	27	0	54	0
2	0	28	0	55	60
3	0	29	0	56	60
4	0	30	0	57	0
5	0	31	0	58	5
6	40	32	10	59	0
7	0	33	0	60	0
8	75	34	0	61	10
9	5	35	0	62	30
10	0	36	0	63	0
11	0	37	0	64	50
12	0	38	0	65	-
13	0	39	0	66	80
14	0	40	5	67	0
15	0	41	0	68	0
16	5	42	5	69	10
17	20	43	0	70	-
18	0	44	10	71	10
19	0	45	0	72	0
20	5	46	0	73	0
21	0	47	0	74	5
22	0	48	15	75	20
23	0	49	-	76	50
24	0	50	50	77	25
25	0	51	25	78	15
26	40	52	0		
		53	15		

* Quadrats were all sampled at depths between 2 and 4 metres.



ENVIRONMENT ONTARIO	
SHEBANDOWAN LAKES SYSTEM FIGURE : 2	
SCALE : AS SHOWN	
DRAWN BY : L.L. BROOME	DATE : JULY, 1973
CHECKED BY : M.G.	DRAWING Nº : 73-42-WQ

The information in Table 3 indicates two significant features in the lake system. In an overall evaluation, the aquatic weed growth, particularly in Upper and Middle Shebandowan, is scattered. Also, growth was encountered in 14 of 23 quadrats in Lower Shebandowan, as compared with 7 of 26 in Upper Shebandowan and 8 of 26 in Middle Shebandowan. The information indicates a higher growth density in Lower Shebandowan than in the two other lakes of the system. However, this survey, because of its semi-quantitative nature, cannot be considered conclusive.

Tables IV, V and VI again illustrate the scarcity of overall plant growth. Some stations, in fact, show only a few species present, while others show none at all, as is the case with stations Q41 and Q43. The stations with little growth were usually associated with the rocky substrate discussed earlier. Included in these tables are those species which are noted as growing at the shoreline. Scirpus, Equisetum and Typha grew in many areas along the shore in little or no water.

Table VII, illustrating the frequency of occurrence of the most common species, indicates that in most cases there is a consistency between the three areas of sampling. Some species, however, were more frequently encountered in Lower Shebandowan than in the other two areas. By far the most

frequently noted species were Myriophyllum and Isoetes. Myriophyllum occurred at 42.3% of the stations in Upper Shebandowan, 69.2% in Middle Shebandowan and 56.5% in Lower Shebandowan. The calculated frequency of occurrence for Isoetes was 30.7%, 57.7% and 69.6% in Upper Shebandowan, Middle Shebandowan and Lower Shebandowan Lakes respectively.

The examination of the spawning beds revealed the following information. Three genera; Myriophyllum spp., Lobelia dortmanna and Isoetes spp., were encountered, covering about 75% of the bed. This percentage, however, decreased to 10% at 3 - 5 metres.

CONCLUSIONS

A survey to determine the variety and approximate density of plant growths in Lake Shebandowan indicated that Isoetes spp., Myriophyllum spp. and Potamogeton robbinsii were the most abundant flora. Densities of all aquatic plants were shown to be generally sparse throughout the system, and many species were found to show preferences for specific substrate types. This survey was conducted to determine the variety and approximate density of plant growths in Lake Shebandowan and it is hoped that it will serve as a useful introduction from which to begin any quantitative assessments of aquatic plant growth in this lake system.

A brief investigation on October 25, 1973, of the spawning beds between Little and Big Bare Islands revealed growths of Lobelia dortmanna, Isoetes spp and Myriophyllum spp. It would be of considerable value to re-examine these areas at the time of spawning to aid in evaluating the impact of these plants on spawning activities.

ACKNOWLEDGEMENTS

Thanks are extended to Mr. J. Duffield whose enthusiasm for diving and interest in the aquatic environment contributed greatly to the field program.

REFERENCES

1. Ryder, R. Fish and aquatic plants of the Shebandowan Lakes. (Personal communication).

2. Mulligan, H. F. Management of Aquatic Vascular plants and Algae. Eutrophication: Causes, Consequences and Correctives. National Academy of Sciences, Washington 1970.

3. Fasset, N. C. A Manual of Aquatic Plants, University of Wisconsin Press, 1966.

4. Millard, E. S. and D. M. Veal. Aquatic Weed Growths in Lake Simcoe. Ontario Water Resources Commission, November, 1971.

5. Jones, M. and D. M. Veal. Aquatic Weed Growths in Lake Couchiching. Ontario Ministry of the Environment, 1972.

A P P E N D I X

Table IV. Species of Aquatic Plants and their densities for the general assessment at 76 Quadrat Stations on Lake Shebandowan, July 24 - August 11, 1972

SPECIES		UPPER SHEBANDOWAN QUADRAT STATIONS																								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Potamogeton	pectinatus																				4			4		4	4
Potamogeton	gramineus		4				4															4			4		4
Potamogeton	Richardsonii	4							4	3						4		3				3				4	
Potamogeton	epihydrus															2			4								
Potamogeton	Robbinsii					2			4	4						4	4	3		4			4		3	4	4
Potamogeton	amplifolius																						4				
Polygonum	natans																										
Myriophyllum	alterniflorum		4						4					4	4		4	4	4				4	4	4	4	
Isoetes	spp.						3							4				4	2	4					4	2	2
Lobelia	dortmanna																					2					4
Eleocharis	spp.						2		1																		4
Sagittaria	latifolia												4			1								3			
Equisetum	spp.																									2	2
Scirpus	spp.				3		2		2	3		4							3	3	3		3	3			
Ranunculus	spp.					4	4										3			4		3	4				
Elodea	canadensis																4										
Sparganium	americanum								2										4					4			
Vallisneria	americana		4			4									4			4								4	4
Najas	flexilis																4	3			3						
Utricularia	vulgaris								4											4							
Nuphar	advena															4					3						
Nymphaea	odorata															4							3				
Nitella	spp.																										
Chara	spp.																										
Brasenia	schreberi								4							4											
Heteranthera	dubia																4				4						
Bidens	beckii						4			4						4	4	4									
Typha	spp.						2		2									4					3				

Table V. Species of Aquatic Plants and their densities for the general assessment at 76 Quadrat Stations on Lake Shebandowan, July 24 - August 11, 1972

		MIDDLE SHEBANDOWAN QUADRAT STATIONS																												
SPECIES		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53		
Potamogeton	pectinatus							4				4		4	4					4	4		4				4			
Potamogeton	gramineus	3	3			4	4	3				4									4		4			4	4			
Potamogeton	Richardsonii											4																4		
Potamogeton	epihydrus														4		4		4											
Potamogeton	Robbinsii	4	4				4	3																	4					
Potamogeton	amplifolius						4								4															
Polygonum	natans																													
Myriophyllum	alterniflorum	4	3	4		3		4	4	4	4	4	4	4	4		3			4				4	4		4	4		
Isoetes	spp.	4						4				4		4	4		3		1	2	4		3	4	3	3	4	4		
Lobelia	dortmanna								.											3			3	1	3	4		4		
Eleocharis	spp.																						4							
Sagittaria	latifolia	3																												
Equisetum	spp.	3		3		3									3															
Scirpus	spp.				3		3	4	3	3	4	3	2	4					3	4	3						3	3		
Ranunculus	spp.						4																							
Elodea	canadensis																													
Sparganium	americanum																4									4				
Vallisneria	americana	4	4														4				4							3		
Najas	flexilis	4					3																							
Utricularia	vulgaris		4																											
Nuphar	advena				4																						4			
Nymphaea	odorata						3																							
Nitella	spp.																													
Chara	spp.																						4							
Brasenia	schreberi																													
Heteranthera	dubia																													
Bidens	beckii										4																			
Typha	spp.					3			3	3		3	2									3						3		

Table VI. Species of Aquatic Plants and their densities for the general assessment at 76 Quadrat Stations on Lake Shebandowan, July 24 - August 11, 1972

		LOWER SHEBANDOWAN QUADRAT STATIONS																							
SPECIES		54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	71	72	73	74	75	76	77	78
Potamogeton	pectinatus			3					2	4	4				4	4	4	3	4			4	4	4	
Potamogeton	gramineus		4		4		4				4				3	4			4				4		
Potamogeton	Richardsonii	4	4	4											3		3								
Potamogeton	epihydrus								4																
Potamogeton	Robbinsii	4	3					2	2					1			3				3				4
Potamogeton	amplifolius			3															4						
Polygonum	natans																								
Myriophyllum	alterniflorum	4	4		4	4	4	3	4	4	4						4		4		4		4		
Isoetes	spp.	2	2		4	3	4		3	2	3	2			4	1		4		4		2		2	2
Lobelia	dortmanna	4				4												4				3		3	3
Eleocharis	spp.																								
Sagittaria	latifolia			4																					
Equisetum	spp.																								
Scirpus	spp.		3		3		2		3	3				3	2										
Ranunculus	spp.																								
Elodea	canadensis																		3						
Sparganium	americanum		2	2	4									3				3							
Vallisneria	americana							3		2	4					4	4		4						
Najas	flexilis			3					4														4		
Utricularia	vulgaris		4					4		4															
Nuphar	advena							3																	
Nymphaea	odorata																								
Nitella	spp.																						4		
Chara	spp.																								
Brasenia	schreberi																								
Heteranthera	dubia																								
Bidens	beckii																								
Typha	spp.							3																	

Table VII. Relative Frequency of the 17 most common species found at Quadrat Stations in the Shebandowan Lakes, July 24 - August 11, 1972.

		UPPER SHEBANDOWAN*					MIDDLE SHEBANDOWAN					LOWER SHEBANDOWAN				
		1	2	3	4	Frequency of Occurrence	1	2	3	4	Frequency of Occurrence	1	2	3	4	Frequency of Occurrence
Potamogeton	pectinatus	-	-	-	4	15.4	-	1	2	8	43.4	-	-	-	8	30.7
Potamogeton	gramineus	-	-	-	5	19.2	-	-	1	7	34.8	-	1	2	7	38.5
Potamogeton	Richardsonii	-	-	2	4	23.1	-	-	2	3	21.7	-	-	-	2	7.7
Potamogeton	epihydrus	-	1	-	1	7.7	-	-	-	1	4.3	-	-	-	3	11.5
Potamogeton	Robbinsii	-	1	2	8	42.3	1	2	3	2	34.8	-	-	1	4	19.2
Potamogeton	amplifolius	-	-	-	1	3.8	-	-	1	1	8.7	-	-	-	2	7.7
Myriophyllum	spp.	-	-	-	11	42.3	-	-	1	12	56.5	-	-	3	15	69.2
Isoetes	spp.	-	3	1	4	30.7	1	7	3	5	69.6	1	1	4	9	57.7
Lobelia	dortmanna	-	1	-	1	7.7	-	-	3	3	26.1	1	-	3	2	23.1
Sagittaria	latifolius	1	-	1	1	11.5	-	-	-	1	4.3	-	-	1	-	3.8
Ranunculus	spp.	-	-	2	4	23.1	-	-	-	-	0	-	-	-	1	3.8
Sparganium	americanum	-	1	-	2	11.5	-	2	2	1	21.7	-	-	-	2	7.7
Vallisneria	americana	-	-	-	6	23.1	-	1	1	4	26.1	-	-	1	4	19.2
Najas	flexilius	-	-	2	1	11.5	-	-	1	2	13.0	-	-	1	1	7.7
Utricularia	vulgaris	-	-	-	2	7.7	-	-	-	3	13.0	-	-	-	1	3.8
Nuphar	odorata	-	-	1	1	7.7	-	-	1	-	4.3	-	-	-	2	7.7
Bidens	beckii	-	-	-	5	19.2	-	-	-	-	0.0	-	-	-	1	3.8

* The number of quadrats examined on Upper, Middle, and Lower Shebandowan Lakes were 26, 23 and 26 respectively.